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AGRICULTURAL MACHINE INDUSTRY OF CHINA GIVEN SERIOUS CONSIDERATION

Communist China started on the long expected third 5-year plan from this year, but judging from the editorial of the New Year's edition and from other issues of the Jen-min Jih-pao, it seems that the third 5-year plan will continue to follow the policy of "using industry as a guiding hand with agriculture as a base for people's economic development." In the policy of agricultural production growth, the "four-izations", namely, the water utilization, mechanization, chemicalization and the electrification and the "eight point charter" of soil improvement, greater use of fertilizers, development of water works, distribution of superior products, close planting, protection of plants, field management and improved implements have been cited and the objective is for greater harvest undeterred by natural calamities.

During the National Machine Products and Design Conference held in Peiping in December 1965, a decision to place an importance on mining and agricultural machines based on above policies was established. The following statement was issued.

"Basing on the task of the third 5-year plan and the technical situation in the present day China, the importance will be placed on revolutionary designs and production of mining and agricultural machines. From a strategic mission, a large amount of practical and highly efficient mining and agricultural machines must be designed as soon as possible." (NCNA, 21 Dec 1965)

A large development of agricultural machines is expected from this third 5-year plan. The trend toward development has become noticeable and the results of this improvement have been reported frequently since this year. The following is the trend seen in recent Chinese machine industry centered around tractors, towed farm equipment, agricultural products processing machines, irrigation and drainage machines, spraying machines, etc.

Rapid Progress in Mechanization

The mechanization of farms in China was placed on the agenda in early 1958 under the second 5-year plan. A greater emphasis was placed after the three successive years of natural calamity which began in 1959.

According to the New China News Agency report on 29 September 1965, the production of tractors gained five times over the production of 1957 (24,629 (15 hp) in 1957; therefore, 123,145 in 1965). The number of farm machines stations (or tractor stations) totaled 1400 and the large scale state operated farms totaled over 2,000. No national statistics on the mechanized cultivation is given but about 60% of the farms outside of Peiping, about 40% in Foshan Special District of Kwangtung Province and about 33% in Northeast Provinces have become mechanized.

The above NCNA report also stated that the total drainage and irrigation facilities increased thirteen times over 1957 or over 7,000,000

horsepowers. About 90% of the entire provinces now have pump statiens. Kwangtung Province alone has spent 10,000,000 yuan (150,000,000,000 yen) in water works during 1958 to 1964. Over 70% of farm lands in Hang-chou--Chia-hsing-- Hu-chou plains in Chekiang Province are equipped with either diesel or electric pumps. Furthermore, the amount of mechanical and electrical water drainage and irrigation facilities in Su-chou Special District of Chekiang is said to be over 80% of the entire farmlands of China. The total capacity of drainage and irrigation pumps in farms outside of Peiping increased by 9.7 times that of 1957. During January to September 1965, 2,500 hydro turbine pumps were installed in farm villages throughout the country.

The number of small and medium size farm equipment reached one billion pieces in 1965 (NCNA, 27 Dec 1965).

The steel materials needed for the manufacture of farm machines in 1965 increased by 27% over 1964. Test manufacture of new steel products for agriculture increased by 21 items over 1964 (Chung-kuo Hsin-wen, 15 Feb 1966). The Ministry of Metallurgical Industry and the Ministry of Machine Building provided with 1,000,000 tons of steel and scrape iron needed for the production of 1 billion pieces of small-medium size farm implements produced in 1965 (NCNA, 27 Dec 1965).

13 Types of Tractors

China was not able to produce any tractor prior to 1957; however, tractor plants, other than No.1 Lo-yang Tractor Plant, were established in Shang-

hai, Shen-yang, An-shan, Nan-ch'ang and Wu-han. These plants produce 13 types of tractors ranging from a small horsepower to a largest one of 100 horsepower. Five of these 13 types were newly produced in 1965 (NCNA 31 Jan 1966).

Those known are the "Hung-ch'i 100", "Tung-fang-hung 75", "Tung-fang-hung 54", "Feng-shou 35", "Tung-fang-hung 28", "Yueh-chin 20" and the "Kung-nung 7" hand tractor. Beside these, 160 horsepower "Tung-fang-hung" bulldozer, 40 horsepower "Tung-fang-hung" land and water wheel tractor, "Kung-nung 5" hand tractor were test manufactured during 1965.

"Hung-ch'i 100"

This is a large type 100 horsepower tractor used for large scale land development and water works. It can be converted to bulldozer, power shovel, roller and crane for construction work.

"Tung-fang-hung 75"

This type manufactured by Lo-yang No. 1 Tractor Plant is a 75 horsepower tractor suitable for cultivation of dry farming districts in northeast and northern China. This tractor is basically a remodeled "Tung-fang-hung 54"; therefore, 90% of the parts are interchangeable. The model 75 is capable of cultivating 14 mou (1 mou = 1/15 ha) per hour, which is 35% greater than the area covered by model 54. It can be also used for ground leveling and for sewing. The materials used and the cost

of production are same as those of model 54 and the fuel consumption is about same.

"Tung-fang-hung 54"

This is a representative product of the Lo-yang No.1 Tractor Plant. This is a caterpiller type producing 54 horsepower and is used mainly on farms. In 1965, Kwangtung Province used this model for rice fields by attaching water resisting and friction decreasing devices.

"Feng-shou 35"

This type is manufactured principally for rice fields. It has 35 horsepower and weighs only 1.5 ton. It has a very small turning radius, which is suited for narrow rice fields of 3 to 5 mou. It is capable of cultivating 5 mou per hour. It is easy to operate and can be used for spreading fertilizer and drainage work by attaching appropriate equipment. This type is produced in Shanghai.

"Tung-fang-hung 28"

This 28 hprsepower wheel type was designed mainly for cotton and corn fields. It has a maximum speed of 25km per hour, which is suitable for cultivating, ground leveling, sewing, fertilizing and transporting.

"Yuehchin 20"

This is a small multi purpose 20 horsepower tractor. This can

be used in level fields but it is not suited for fields in narrow valleys and hills. It is capable of climbing an incline of 25 degrees. It can be used for sowing, weeding, harrowing, transporting and water pumping besides cultivating. It can cultivate 5 mou per hour. A mass production of this type started in 1965 at the Yun-ch'eng Tractor Plant in Shansi Province.

"Kung-nung 7" Hand Tractor

This 7 horsepower tractor is used specicfically in vegeatable, fruit and terrace farms. It can cultivate about 1.2 mou per hour and can be used for ditch digging, harrowing, weeding and for making levees. Engines can be used for producing electricity, threshing and for milling. This type was designed in Shanghai and is produced in Shanghai, Wu-han, Peiping and Shen-yang.

The Lo-yang No.1 Tractor Plant produced only the "Tung-fang-hung 54" until 1965 but has expanded into producing "Tung-fang-hung 75" tractor, generating units, distributing type oil pumps and hydraulic suspension system. At the same time, the plant also test produced 40 horsepower land and water wheel type tractor and 160 horsepower bulldozer.

In 1965, the plant mechanized the electric plating department which was formerly carried out manually. This mechanization increased the production by 6.5 times. The cost of production decreased each year. The cost per unit in 1964 was 1,000 yuan less than 1963 and the cost in 1965 was 1060 yuan less than 1964. The productivity of each worker increased by 7.6 times. The total production increased by 80% and the waste ratio

decreased by 11%.

Besides the plants mentioned above, Shih-chia-chuang Tractor Parts Plant, Wu-yang Nozzle and Oil Pump Plant, Nan-ch'ang Tractor Parts Plant, Pang-fou Tractor Parts Plant, Lu-k'ou Internal Combustion Engine Parts Plant, K'ai-feng Tractor and Electric Machine Plant are either built or are being built for the greater development of tractor industry. Among the above plants, K'ai-feng Tractor and Electric Machine Plant started operating in August 1965. This plant produces 20 items including the direct current and alternating current electric generators, selsyn meters, motor regulators for charging and induction coils. The Nan-ch'ang Tractor Parts Plant, which specializes in the production of tractor gears and forged parts for diesel engines, started operating in December 1965. The size of these gears varies from 20mm to 447mm and comes in 40 different shapes from circular to cylindrical to bevel.

Superchargers to increase the efficiency of tractors were successfully test produced in October 1965 at K'un-ming and are now being produced in small quantity. The attachment of this supercharger on the "Tung-fang-hung 54" tractor increases the horsepower to 60 - 65 and reduces the fuel consumption. A complete line of tools needed for repair works is now being produced.

Production and Development of Internal Combustion Engines for Farming

Internal combustion engines are necessary for mechanization of farms. The internal combustion engine industry of China has made a rapid progress.

At present, 50 - 300 horsepower diesel engines are being mass produced to meet the agricultural need. At the same time, larger engines of 400, 500 and even 1,000 horsepower are being manufactured.

In 1965, four types of 10 horsepower diesel and 5 types of gasoline engines were designed and manufactured.

The production technique level of Chinese diesel engine industry improved greatly. They are now manufacturing exhaust gas turbine, superchargers, hydraulic gear box, fuel injection pumps and air cool diesel engines (NCNA, 19 Feb 1966).

Approximately 140 different types of internal combustion engines and generating equipment are being used on Chinese farms today.

Over 100 Types of Agricultural Pumps

Over 100 types of agricultural use pumps were being produced in China during 1964 (Chun-kuo Hsin-wen, 27 Oct 1964).

Mixed flow pumps needed in areas of sufficient water supply are being produced. At present, 16 types have been test manufactured. A large pump with an opening of 50cm can pump 1,800 tons of water per hour or able to irrigate 280 ha per day. High head centrifugal pumps, hydraulic turbine and hydraulic ram using diesel engines and meters for terrace farms are now being produced. Recently, the propagation of hydraulic turbine and hydraulic ram pumps are being pushed. These pumps are able to pump up to about 10 meters from a lower level.

Because of the shortage of water resources in northern and north western China, water has to be taken from wells; therefore, 19 types of pumps including the mechanical well pumps, old type well pumps, centrifugal rapid flow deep well pumps were test produced. In general, these pumps are capable of raising the water to about 30 meters from a well and pump about 25 tons per hour. A large pump is able to raise to about 150 tons per hour. A centrifugal type can pump a water from a well of over 50 meter deep. CHIKURYOKU RAKAN [phonetic] pumps used in Outer Mongolia are able to pump from wells of 70 - 100 meters deep.

In addition, other pumps suitable in various areas are being produced in large quantity.

Furthermore, 29 different agricultural use pumps have been designed, test manufactured, tested and started producing in 1965. These pumps use 10KW motors or diesel engines. Out of these, 17 are portable types suitable for narrow rice fields in South China and 6 are suitable for irrigation from underground water in northern China.

Cultivating, Sowing, Harvesting, Processing Farm Equipment

The following is on cultivating, sowing, harvesting, processing equipment which have been successfully test produced and mass produced recently.

Cultivating :

In 1965, 11 share and 7 share tractor drawn plows were successfully

test produced in Liaoning Province. The 11 share plow can be used for making ridges, turning ground over and for sowing seeds besides the normal cultivating. This plow pulled by "Tung-fang-hung 54" tractor can cultivate 10 ha in 10 hours.

Rice Planter:

China started on the test manufacture of rice planters since 1956. After many improvements, the planter finally reached a practical stage. A specialized rice planter factory in Nan-ning of Kwangsi Chuang-tsu Self Autonomous Region began production of rice planters in November 1965. Planters produced in this plant is a claw type Kwangsi 65, which is an improved version of Kwangsi 59-3 model. It is possible to plant five rows at a time and is over twice as efficient as hand planting. The umber of seedlings, position and depth of planting can be regulated. Operating handles can be also adjusted according to operator's height. The dead weight of this machine is 25 kg; therefore, can be easily operated by one person.

Sower:

(1) Suspension type 48 rows fertilizer-planter

This machine was designed and built by the Harbin Agricultural Machine. A simultaneous fertilizing and planting operations can be carried out. It is possible to spread grainy, powdery or mixed

fertilizers.

(2) Soil turning and planting machine

This machine successfully test produced by the Anshan Kuang-hua Agricultural Machine Plant is capable of root removing, sowing and furrow covering in one operation.

(3) Furrow sowing

This machine successfully test produced by the Anshan Kuang-hua Agricultural Machine Plant is able to sow about 17 ha in 10 hours.

(4) Close corn sowing machine

The structure of this machine is more simple than the imported square hole sowing machine. Planting is accurate and economizes on seeds.

Harvester:

(1) Tung-fang harvesting combine

The self propelled grain combines, which were produced from 1964, are well constructed and are equipped with hydraulic controls. These machines can be used in low moisture area. The result of harvesting of wheat and rice in northeast China and Peiping area proved that this machine surpassed the efficiency index of comparable foreign combines. It can be operated by one person and is capable of harvesting about 13 ha per day. Cultivating, threshing and grading carried out in one operation.

(2) Rice harvesting combine

This machine was designed by the Kwangtung Agricultural Machine Institute and manufactured by the Kwangtung Tractor Plant. This machine towed by "Tung-fang-hung 54" tractor can harvest over 3.3 ha of rice in one day (10 hrs).

China now produces rice planters, tractors for rice fields, rope pulled cultivating machine and rice harvesting combine. It can be said that the Chinese have finally realized their long dream of mechanized rice harvesting.

(3) Small rotating harvester

This machine was successfully test manufactured in Anhwei Province. This one man operated and animal drawn harvester is capable of harvesting 1 ha in 8 houbs. It weighs slightly over 150 kg and costs little over 200 yuan to have it built.

Farm Product Proceessing Machine

Threshers, flour mills, sweet potato cutting machines, cotton gins, tea leaf machines, oil presses and other machines are being popularized rapidly. For example, over 10,000 proccessing machines for food, oil and fat, sugar, animal feed, tea, cotton and jute have been manufactured and distributed in Kwangtung Province during 1965.

In 1965, the No. 8 Ministry of Machine Building recommended the fellowing four types of grain and rice proccessing machines at the national agricultural conferenc e for testing and selecting grain and rice proccessing machines held in Shen-yang.

(1) NL-130 type spiral reinforced roll rice pearling machine

Weighs 35 kg, cost slightly over 50 yuan, operated by one man and has a capacity of pearling 165 kg per hour.

(2) NSL-2.8 vertical type sand roll rice pearling machine

Millet process treading 1 to 2% higher than comparable machines and ratio of rice being crushed lower.

(3) NM-150 cold air rice pearling machine

Processes different types of grain such as kaoling, millet and corn. Can process 300 kg of corn per hour and over 200 kg of millet per hour.

(4) MNZ-C vertical sand roll rice pearling machine

Over 40 kg lighter than comparable machines and built very rigidly.

Over 20 Types of Sprayers

According to a national plant protection machine conference held in February 1966 at Nanking. Various industries provided farms with large quantity of agricultural insecticide sprayers during the past several years. The number of types increased from 3 to 20 and the quality improved greatly. Between 1964 and September 1965, 3,000,000 of these equipment were distributed (NACA, 29 Sept 65).

They have succeeded in test manufacture of 7 power sprayers and these are now in production. The following are some of them.

(1) NAN 2604 long range sprayer

This machine is suitable for rice fields. It can pump the water and mixes the chemicals automatically. It can spray up to a distance of 15 meters.

(2) High altitude sprayer

This machine was recently test produced by the Shanghai Agricultural Insecticide Machine Plant. The Kun-mung 7 type can be attached to a hand tractor. It can spray up to a height of 17 meters and an area 23 meters in radius.

(3) New tanker type power sprayer

This machine is a new product of the Shanghai Agricultural Insecticide Machine Plant. It is used in rice fields, fruit orchards and cotton field.

(4) Portable sprayer

This equipment was newly produced by the Shanghai Agricultural Insecticide Machine Plant used for forests and farms. It weighs 10 kg and simple to operate.

The following semi-mechanical hand sprayers were tested successfully by the Tientsin City Insecticide Machine Plant during October 1965.

(1) Chin-feng 12 back carrying sprayer

(2) WB-15 back carrying sprayer

(3) Brown plastic shoulder carrying light weight sprayer (3-5kg)

#64 15 March 66

(20)

#14

Technical Revolution of China's Expanding Construction Material Industry Through Utilization of Industrial Waste and Local Resources

For several years, the construction material industry departments in China have exerted their utmost to expand production to meet the national construction requirements of the Third Five-Year Plan, which began this year. Cement factories were built throughout the nation already and are now producing several tens of million tons of cement. The variety of cement produced has also increased; high-grade and special types are also being successively produced.

The cement industry was discussed in detail in No 46 of this publication (15 June 1965) therefore it is suggested that referral be made to it and /_ in this report _/ the great technical revolution of the construction material industry, following the design revolution carried out by the basic construction departments, will be discussed.

New Construction Material Produced From Industrial Waste and Local Resources

At present, ordinary clay bricks are used as wall material in more than 90% of the buildings in China. This brick is almost comparable to the T'ai-chuan (3141/4331) and Han-wa (3352/3907) of ancient China -- small slabs that are heavy as well as fragile and lacking in adiabatic and soundproofing qualities. The production of standard clay bricks requires digging up of several tens of thousand mou of agricultural fields and several hundred thousand workers to carry it out. At the same time,

productivity is rather low for the amount of hard work required. The rate of speed in construction work is slow and expenditures high when bricks are used because each brick has to be laid manually. Consequently, it cannot match the increasing construction requirements. Faced with this situation, many of the construction material departments throughout China have mutually united with design, construction, and scientific reaearch units and have manufactured many types of new, light-weight, ut strong large-size, hollow wall material by utilizing industrial waste and local resources and using them in place of standard clay bricks for building construction. At present, the target of the technical revolution now being carried out by the construction material departments of China is centered on solving the large wall material and steel material requirements for construction, which is somewhat backward in technique.

The production of new construction material from industrial waste has developed greatly during the past few years. As of August 1965, 16 new products were either being produced or trial produced. More than 300,000 cubic meter of block were produced by steam nourising FURAIASSHU [phonetic] concrete. The progress in research and trial manufacture of ceramic granule (aggregate), which was launched rather late, has been comparatively rapid, the intermediate tests for shale-ceramic granule and the Ta-ch'ing clay-ceramic granule have been completed. The blast furnace slag is now widely used as raw material for cement and made into various types of concrete products.

Several tens of newly built slag/brick plants have been recently put into production throughout China. These plants can annually produce nearly one million metric tons of furnace slag, mine slag, and FURAIASSHU bricks as well as furnace slag blocks.

Aside from the foregoing, a number of model plants that will produce new construction materials are being successively built. Model buildings using the new materials are also being constructed to facilitate the popularization of scientific research. Many of the construction material departments are also diligently attempting to develop various types of new material through industrial waste recovery. At the same time, the departments concerned have made the necessary arrangements to carry out technical innovations to increase productivity at some 1,000 state-operated brick plants throughout the country.

Some Ten Varieties of New Wall Material Produced in Peiping

More than ten varieties of wall material using industrial waste, including mine slag, furnace slag, FURAIASSHU bricks and wallboards are now produced in Peiping. The Shih-ching-shan Slag Manufacturing Plant was built in 1964. It entered trial production after the first phase project was completed in August. This plant, situated close to the Shih-ching-shan Iron and Steel Company, utilizes the slag waste of this company and mixes it with some lime to produce blocks and bricks. The production process at this plant is mechanized from pulverizing the raw material to

molding. When completed, this plant will have the capacity to produce, annually, 9,000 pieces of brick from 200,000 tons of slag.

Furthermore, from September 1964, research and tests to produce large size wall block (panel) from FURAIASSHU and mine slag were launched by the Research Academy of Architecture Science, subordinate to the Ministry of Building Construction and the Shih-li-pao Structural Member Plant, subordinate to the Peiping Municipal Bureau of Building Construction. This resulted in success within less than a year. Large-size blocks play a major role in prefabricated construction. To date, cement and brick have been used as raw material; however, the processing methods were complicated and costs, high. The use of FURAIASSHU and mine slag as raw material not only means utilization of waste from electric generating plants and iron and steel plants but also conservation of cement and brick. The scientific technicians at the Research Academy of Science had previously experimented with using FURAIASSHU to make bricks. The size of this brick is smaller than the block. Since experience in producing large size blocks from FURAIASSHU was nil, the designing and building of the production line was completely a new experience. The technicians left their laboratories and went to work at the Shih-li-pao Structural Member Plant. They worked together with the other workers of the plant and by combining the various departments under unified guidance, experimental research was smoothly carried out. For example, only small scale testing could be carried out in the laboratory while various coordinated

tests under various situations could be carried out at the sites [construction]. Several months of effort resulted in the production of some 200 types of blocks that met the pressure resistance and contractility standards. These blocks conserve about 40 kilograms of cement and 50 bricks per one square meter of construction as compared with concrete blocks. A production line that can produce 7,000 cubic meters of large size blocks, annually, has been completed at the Shih-li-pao Structural Member Plant.

These new wall materials produced in Peiping are strong and possess good adiabatic and heat insulation qualities and have been proven suitable.

Peiping Successful in FURAIASSHU Ceramic Granule and Foam Block Production

In 1963, the workers of the Tientsin Municipal Building Construction Department began a research on construction material produced through utilization of industrial waste. The coastal city of Tientsin is a well integrated industrial city which annually requires more than one million tons of construction material, including cement, sand, and stone. These material were usually transported from regions 200-300 and even as far as some 500 kilometers away. This municipality also requires several hundred million peices of clay bricks during one year. This means digging up between 30-40 ha of agricultural fields. At the same time, more than a million tons of FURAIASSHU and slag are turned out annually

by industrial enterprises, which makes it necessary for the State to expend tremendous capital for disposal expenses. Consequently, integrated use of industrial waste to produce new light weight building material is greatly anticipated.

The Institute of Architecture Science subordinate to the Tientsin Municipal Building Construction Bureau and the Northeast Academy of Architecture Design have cooperated with each other and have carried out experiments for more than a year and have succeeded in producing FURAIASSHU ceramic granule (aggregate). This product is produced by sintering FURAIASSHU, a waste from thermoelectric generating plants, that has been mixed with a small amount of clay. When this product is used as an aggregate to make concrete, the amount of cement used does not change and the strength also remains the same while the weight per one square meter is reduced by 300 kilograms. As a result, the foundation work of a building can be simplified and cost, reduced. Furthermore, the FURAIASSHU ceramic granule concrete can be made into various types of heavy building material, including large size wallboards, baseboards, beams, and pillars; however, according to the data submitted by the Tientsin Municipal Construction Department, this large size wallboard is one-third lighter than that made from standard concrete; the baseboard is one-fourth lighter.

The workers at the Tientsin Municipal Construction Department are producing boards and slabs from FURAIASSHU, wool scraps, waste lime,

scraps from steel manufacturing plants and using them in place of clay bricks for walls. One cubic meter of blocks replaces 800 bricks; the weight of the wall is reduced by one-third as compared with standard brick wall; moreover, the heat insulation capacity is also much better. Working with FURAIASSHU block is very convenient and construction costs can be reduced by 10 percent as nails, saw, and planes can be used on this block.

The workers at the Tientsin Municipal Building Construction Department are producing light weight construction material, including FURAIASSHU ceramic granules, foam FURAIASSHU silicon blocks as well as FURAIASSHU bricks in large quantities. The improved FURAIASSHU ceramic granule roasting vertical kiln, with an annual capacity to produce 25,000 cubic meters and the newly built 3,000 cubic meter foam FURAIASSHU block intermediate trial production line are now in operation. Furthermore, another large size FURAIASSHU ceramic granule plant with an annual capacity to produce 70,000 cubic meter is under construction at present.

Heavy Duty Slag Hollow Brick Produce in Huai-nan Shih

During the early part of 1965, the Institute of [Architecture] Science, subordinate to the Anhwei Provincial Construction Department, together with the Huai-nan Prefabricated Concrete Products Plant, have succeeded in producing heavy duty hollow brick made from slag. The strength, cold resistance, heat insulation, and corrosion resistance capacities of this hollow brick were many times tested and found to meet the

the requirements of walls for homes. This heavy duty slag hollow brick is light weight and attractive. The size ratios of standard clay tile to these three varieties that were successfully trial produced are 3 to 6, 2 to 4, and 1 to 7 respectively; the weight is lighter as compared to standard clay tile of equal dimensions.

The economic advantages are very large in the production of heavy duty slag hollow tile, including the following:

1. Raw material for this brick can be obtained from slag and FURAIASSHU coming from the blast furnace and electric generating plants, respectively, thereby converting large volume of industrial waste. This means not only conservation of land by eliminating piling of industrial waste but also advantageous from the standpoint of sanitation and trans - portation in the surrounding areas of cities.

2. This brick does not require clag therefore for every 10 million pieces of slag brick produced, some 50 mou (more than 3.3 ha) of land can be conserved.

3. The amount of mortar used in laying this brick is more than 30 percent less than standard brick, thereby increasing efficiency while reducing cost. Furthermore, the production of this brick is not limited to a certain season and the production cycle, from processing of the raw material to manufacturing the finished goods, is completed in two or three days and is much shorter than the standard brick production cycle. Moreover, the equipment to produce this hollow brick can be produced domestically.

Kweichou's Active and Developing Construction Material Industry

Kweichou Province, with its relatively weak industrial foundation in construction materials, is exploiting its mountainous terrain and exerting positive efforts to develop the production of construction materials with the ashes, sand, rocks and coal ashes, which are found in abundance in this province. The first workshop of the Kuei-yang Silicon Brick Plant for producing cement bricks has already been completed and it is currently engaged in test production. The Kuei-yang Shale Brick Plant for producing shale bricks and the Kuei-yang Silicon Brick Plant for producing FURAIASSHU [phonetic] blocks are currently under construction.

Heretofore, mountainous Kweichou Province was only capable of producing clay bricks, which required the uprooting of vast acreages of fertile fields. Since the soil stratum is somewhat shallow in Kweichou, soil from about 20 hectares were required to produce 100 million pieces of clay bricks. Moreover, since "three straight days of clear weather" is a rarity in Kweichou, the heavy rainfall generally restricted the productive period to 20-odd days. Accordingly, production volume was low, quality was not ideal and the production facilities lagged far behind demand.

The external surface of the cement bricks being produced by the already completed workshop of the Kuei-yang Silicon Brick Plant is smooth and flat. They are heavy and their resistance against pressure and breakage is quite high. The external surface of the shale bricks test produced by the Kuei-yang Shale Brick Plant, still undergoing construction, is smooth and flat. They are extremely hard and durable and suitable for heavy duty such as construction work. Cement bricks and shale bricks are both superior to the regular clay bricks.

These three new plants are using raw materials such as limestone, shale and sandstone, which are extremely plentiful in this province, or FURAIASSHU [phonetic] or slag in place of clay to produce bricks for construction use. This benefits agricultural production because it does not use up the soil from the fields. Moreover, since they are not affected by the weather or the seasons, they are capable of operating throughout the year. These three plants are makeshift plants constructed on the principle that they would use local resources, stress production and deemphasize livelihood. The plant sites are all located atop their raw material deposits. The workers of the Kuei-yang Shale Brick Plant, which is located in the suburb atop a shale mountain, initially constructed a shack on top of a barren mountain, installed machinery, built a kiln, test produced shale bricks employing native methods and submitted the calcinated bricks to the state. Thereafter, using the imperfect bricks, they constructed their living quarters.

Group of FURAIASSHU [phonetic] Brick Plants in Heilungkiang Province

Two FURAIASSHU [phonetic] plants and one silicon plant began formal production in Heilungkiang Province in October 1965. Six other plants have already been constructed in this province. The raw materials used by these plants are residues and ashes discarded by industrial enterprises. They are being used to produce extremely useful construction materials such as FURAIASSHU [phonetic] bricks and silicon blocks. As of October 1965, the already operating plants had produced FURAIASSHU [phonetic] bricks and silicon blocks comparable to several million red bricks and delivered them to the construction interests in this province. According to use and test result testimonials, the resistance of these new construction materials against pressure and breakage surpass the quality standards prescribed by the state

for red bricks.

Szechwan's BOTAISHI [phonetic] Bricks Also Beneficial to Coal Mines

In early 1965, the Yung-jung Mining Bureau in Szechwan Province successfully test produced BOTA [phonetic] bricks using the BOTA [phonetic] obtained from the coal mines. Thereafter, a succession of BOTAISHI [phonetic] brick plants are producing BOTAISHI [phonetic] bricks in Szechwan Province. The production of bricks using BOTAISHI [phonetic] in place of clay opens up new horizons in the development of construction materials production and it also lightens the load imposed on coal production.

BOTAISHI [phonetic] is a stromatolithic formation located above, below or in between layers of coal under the ground. In digging for coal, it is necessary to remove these stromatolithic layers of BOTAISHI [phonetic]. Heretofore, in order to facilitate normal coal mining operations, a portion of the BOTAISHI [phonetic] was used to fill the cavities created when the coal was removed. The remaining major portion of the BOTA [phonetic] was being carried out and scrapped above ground. Statistically, the removal of 1/2-1 ton of BOTAISHI [phonetic] was required to produce one ton of coal. Since the layers of coal are thin in many of the coal mines in Szechwan Province, very little filler is required and huge volumes of BOTAISHI [phonetic] are scrapped above ground. Accordingly, large ground sites are required to accomodate the BOTA [phonetic] calling for huge expenditures in manpower, materials and funds.

After repeated trial and error for over a year, the scientific researchers and production officials in Szechwan Province certify that BOTAISHI [phonetic] bricks are extremely high quality construction material. Physically and chemically they are better than ordinary clay bricks - their compressive strength is 4-5 times higher, they are less susceptible to breakage, and

they can withstand acids, alkalies, efflorescence and freezing weather. They are especially suitable for use as construction material capable of withstanding the corrosive effects of acids and alkalies in the chemical industry and in alkaline areas.

Since BOTAISHI [phonetic] coexists with coal, it contains a certain amount of combustible matter. Accordingly, the calcination of BOTAISHI [phonetic] bricks require very little fuel. Tests prove that the calcination of 10,000 BOTAISHI [phonetic] bricks using a traditional-type kiln consumes less coal (about six tons) than the calcination of the same amount of clay bricks. Using a large kiln results in an additional savings in the consumption of coal.

Development of AE Concrete in Peiping

Porous bricks and large lightweight bricks were successfully test produced in Peiping in 1964. Clay bricks are heavy, create transportation problems, increase the dead weight and cost of buildings, and they require the destruction of vast acreages of agricultural soil. Since porous bricks are perforated, they contain 30% less clay than the regular clay bricks. Their load capacity is the same as regular clay bricks but, since their basic weight is less, porous bricks can lower building costs. Large lightweight bricks float on water because they are lighter than water. They contain a large percentage of mud and their absorption coefficient is about 40% of the absorption coefficient of regular bricks. Since their absorption coefficient is low and since they are not susceptible to freezing, they are suitable for use as lagging material for refrigerators or covering for steam pipes.

Additionally, a 4-story building made of air entraining (AE) concrete

was recently constructed in Peiping. AE concrete is light and adiabatic. The use of AE concrete in wall construction reduces the weight of construction material from 1/3-2/3 and permits a large reduction in the weight of the materials to be transported. Houses constructed with this material are cheaper to heat in the winter and remain relatively cool in the summer. Since this material can be molded, sawed or planed, and processed in various sizes and shapes, it can benefit block-making methods and construction mechanization.

The raw materialsused for AE concrete are extremely variegated. Huge volumes of industrial waste such as FURAIASSHU [phonetic] and slag are being used as well as sand and shale. The primary ingredient attributing to the light weight of this concrete is aluminum powder (AE ingredient). The inclusion of aluminum powder creates air bubbles and provides a bread-like appearance to the finished concrete.

AE concrete, a native product of China, was recently perfected through the joint research efforts of the Research Academy of Architectural Science of the Ministry of Building Construction, the Peiping Municipal Academy of Architectural Designing, the Peiping Municipal Silicon Products Plant and the Peiping Municipal Institute of Building Material Science. In the process, the researchers demonstrated creative spirit. In foreign countries, the aluminum powder waste is all disposed through roasting but in China, it is being disposed safely and economically by chemical means.

Construction of a Prefabricated Building in Peiping Using New Wall Paneling Materials

Recently, a high rise building using two new types of wall paneling materials - FURAIASSHU [phonetic] slag wall paneling and FURAIASSHU [phonetic] aggregate wall paneling - was constructed in Peiping. According to an estimate by authorities concerned, these two new types of wall paneling material are

capable of withstanding the loads anticipated and their adiabatic qualities are good.

The outer walls of this building are constructed of 24-centimeter thick FURAIASSHU [phonetic] aggregate wall paneling and its inner walls are constructed of 14-centimeter thick FURAIASSHU [phonetic] slag wall paneling. The dimensions of these wall panelings are 3-5 meters by 2.7-2.8 meters. Since one sheet of paneling is sufficient for covering one wall surface, one room can be assembled with four sheets of paneling. The main ingredients for these wall panelings are FURAIASSHU [phonetic] waste from thermal power plants and hard slag from iron and steel mills. The panelings are formed by pouring these ingredients over steel reinforcement rods. Being light and strong, the use of these wall paneling materials reduces the weight of the building framework by 25%, thus reducing the basic weight of the building.

According to calculations by the authorities concerned, by constructing houses with these wall panelings in place of regular clay bricks, they can save over 250,000 yuan per 100,000 square meters of wall space and an additional 100,000 yuan from industrial waste disposal costs. The use of these new wall panelings in the construction of buildings would also benefit block-making methods and construction mechanization and raise the tempo of construction. These new cementless wall materials were discovered and test produced jointly through the combined efforts of the scientific technicians, the workers and the teachers/students of the Research Academy of Architectural Science of the Ministry of Building Construction, the Northeast Academy of Industrial Designing of the Ministry of Building Construction, the Peiping Municipal Academy of Architectural Designing, Ching-hua University and the

Peiping Municipal Bureau of Building Construction.

Technical Revolution in Steel Materials for Use in Construction

In Shanghai, over one million square meters of housing for the workers and elementary/middle school buildings were constructed with blocks made of coal ash and FURAIASSHU [phonetic]. The use of these blocks raised construction efficiency 50% and permitted huge savings in agricultural soil and funds.

In the field of steel materials for use in construction, which is another vital point in the technical revolution within the construction materials industry, certain areas are exerting positive efforts in the development of low ferroalloy materials and thin steel such as high tensile strength manganese ferrosilicon rods and high tensile strength steel wire to replace the hitherto used carbon steel. In comparison with carbon steel, low ferroalloy materials permit about a 30% savings in the amount required, they are more durable and their utility is more extensive.

As noted above, China's construction materials industry is currently undergoing a technical revolution. In addition to its vital significance in terms of the combined use of waste matter and local natural resources, increased production and savings, its effects are extending into various areas and directly influencing the framework of buildings, construction methods, assembly work and the tempo of construction. This technical revolution will promote revolutions in designing and construction, and it will expedite realization of the construction [slogan] "quality, speed, excellence and without waste." If China should continue progressing at this pace, she will probably develop many more of her advanced original techniques and expound major transformations in the field of construction materials.

Next 66 Page(s) In Document Denied